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ABSTRACT

This module is the seventh in a series of eleven modules in an energy conservation curriculum for secondary and postsecondary vocational students. It is designed for use by itself or as part of a sequence of four modules on understanding utilities (see modules 3, 5, and 6). The objective of this module is to train students in the recognition, implementation, and utilization of energy consumption and possible opportunities for conservation in the use of residential and small commercial appliances. First, an introduction to the module and definitions of key terms are provided. Next, the text is presented in the following two units: (1) appliance energy use, and (2) appliance labeling program. The information in each unit is presented in lecture format accompanied by laboratory exercises and question/examples for class discussion. A bibliography and several charts illustrating the text material are found at the end of the module. (BM)

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Energy Conservation Curriculum for Secondary and Post-Secondary Vocational Students. Module 7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

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NAVARRO COLLEGE
CORSICANA, TEXAS

April, 1979

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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MODULE #7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

This module is one of a group of 11 modules in an energy conservation curriculum for secondary and post-secondary vocational students. Appliance Energy Conservation Opportunities may be offered by itself or as a part of a sequence of three modules in the following order;

Order	Module	Title of Module
1	3	Understanding Utility Bills
2	5	Lighting Conservation Opportunities
3	7	Appliance Energy Conservation Opportunities

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MODULE #7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

MODULE DESCRIPTION:

The student will be introduced to various household and small commercial appliances. These appliances will be discussed in terms of their operation, energy usage, efficiency ratings, and cost of operation. Alternatives to use of these appliances and method for making their use more efficient will be presented. A survey of energy usage by these appliances will be provided with a discussion of the benefits of applying available energy conservation opportunities. The student will learn to determine the energy efficiency ratings of appliances and apply the ratings to energy conservation opportunities.

GOAL STATEMENT:

The objective of this module is to train secondary and post-secondary students in the recognition, implementation, and utilization of energy consumption and possible opportunities for conservation in the use of residential and small commercial appliances.

UNITS:

1. Appliance Energy Use
   - A. Refrigerator/Freezer
   - B. Cooking
   - C. Dishwasher
   - D. Washing Machine
   - E. Clothes Dryer
   - F. Minor Appliances
   - G. Appliance Energy Conservation Tips
2. The Appliance Labeling Program

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MODULE #7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

TERMINOLOGY

ampere - the unit of electric current as the force of attraction between two parallel current-carrying conductors.

appliance - an instrument or device designed for a particular use; a household or office device (as a stove, fan, or refrigerator) operated by gas or electric current.

kilowatt-hour - a unit of energy or work equal to 1000 watt-hours; equal to about 3,400 BTU's.

thermostat - an automatic control device actuated by temperature and designed to be responsive to temperature.

volt - the unit of measure of electric force. The voltage in the circuit is what makes the current flow.

watt - the unit of electrical power found by multiplying the voltage times the ampere.

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MODULE #7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

UNIT 1

APPLIANCE ENERGY USE

OBJECTIVES: Upon completion of this unit the student will be able to:

1. Appreciate the amount of energy consumed by appliances used in the home.

2. Read appliance labels to determine kilowatt-hour usage.

3. Compute the expense of operating various household appliances.

4. Determine steps to be taken to improve the energy efficiency of home refrigerators and freezers.

5. Discuss energy conservation measures in using cooking appliances.

6. Discuss efficient use of a dishwasher.

7. Discuss laundry appliances and conservation measures for their use.

8. Recognize energy efficiency factors in purchasing and using minor appliances.

LECTURE

INTRODUCTION:

Americans represent approximately 6% of the total world population but consume more than 33% of the total energy consumed in the world. More than 10% of the average American's energy consumption is used for appliances in homes and small

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businesses. It is estimated that the average American family uses 35,000,000 KWH (Kilowatts of electricity per hour) of electricity per year. Ten percent of this would be 350,000 KWH. Rising fuel costs and the disproportionate amount of energy used in the United States raises several questions. Does the United States need the great amount of energy it now uses to maintain its standard of living? Is the energy consumed by the United States being used in ways that assure the most productivity for the amount of energy used? Are all the energy consuming appliances and devices necessary in the wake of the energy crisis?

This module will attempt to answer these questions as they apply to household and small commercial appliances. Space heating, space cooling, lighting, and hot water use will not be discussed in this module because they have been dealt with in the other modules in this series.

UNIT 1.

APPLIANCE ENERGY USE

Approximately 8% of the homeowner's energy bill is used for electrical home appliances. Electricity for home appliances ranks third in the homeowner's energy use behind home space heating and cooling and hot water heating. Heating and cooling a home accounts for 70% of the homeowner's energy use while hot water heating accounts for another 20%. It ranks third in energy use after home space heating and cooling, which accounts for 70% of residential energy, and hot water heating, which accounts for 20%. Figure 1.1)

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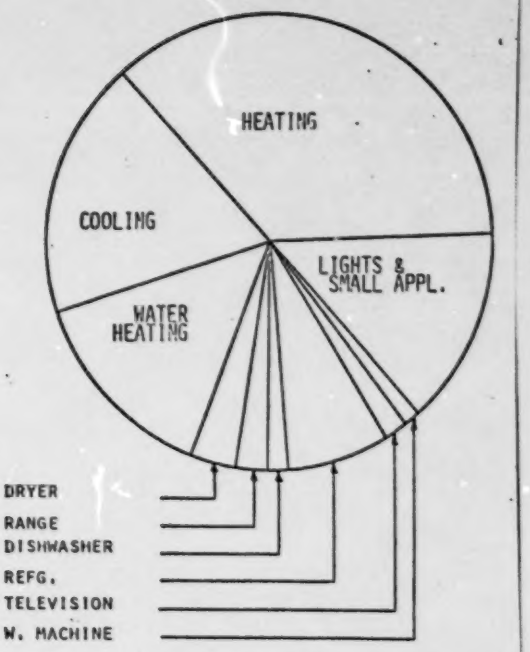
FIGURE 1.1

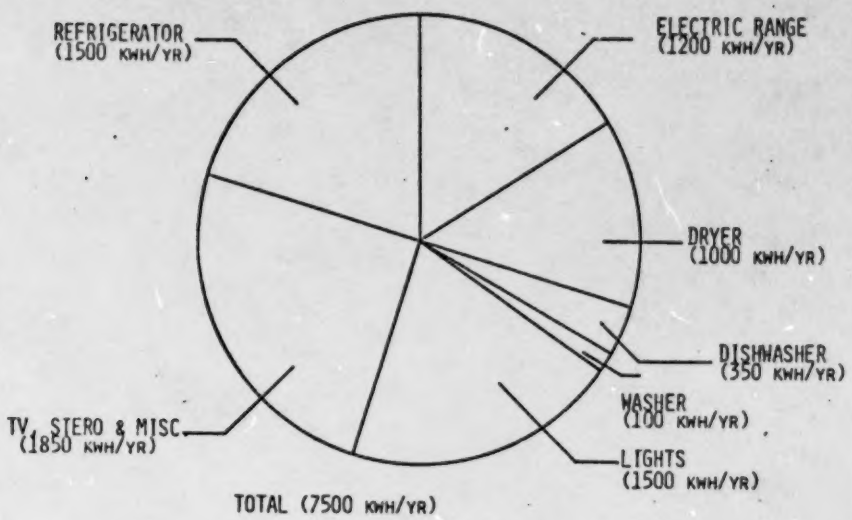
AVERAGE ANNUAL KWH BY APPLIANCE



SOURCE: Texas Power and Light Company

This 8% of the homeowner's energy bill to operate electrical home appliances represents approximately 7500 KWH per year of electrical energy used. (This is for an average family of four). The 7500 KWH/YR figure can be broken down further by estimating approximately 1500 KWH/YR of electricity used by the refrigerator; 1200 KWH/YR used by the electric range; 1000 KWH/YR used by the electric clothes dryer; 350 KWH/YR by the dishwasher; 100 KWH/YR by the washing machine; 1500 KWH/YR by lighting; and 1850 KWH/YR by televisions, stereos, and miscellaneous small appliances. (Figure 1.2)

FIGURE 1.2 APPLIANCE AND LIGHTING ENERGY FOR A TYPICAL FOUR-PERSON FAMILY



The amount of energy used by appliances varies among types of appliances, brand names, size of appliances, geographic area of use, and the individual use of the appliance. The key in determining the amount of energy an appliance uses is in the wattage of that appliance. An appliance with a wattage rating of 1000 watts uses one kilowatt hour of electricity for every hour it is in operation. Figure 1.3 shows how much electrical energy an appliance uses in one hour of operation at various wattage ratings and the approximate amount of oil or coal burned at the power station to produce that amount of electrical energy. By multiplying the customer's cost of one kilowatt of electricity by the kilowatthours of energy used per hour, one can determine the cost of one hour's operation for any appliance in the home.

FIGURE 1.3

ELECTRICAL APPLIANCE ENERGY TABLE

Appliance Wattage Rating	Kilowatt-Hours of Energy Used Per Hour	Ounces of Oil Burned Per Hour	Ounces of Coal Burned Per Hour
10	1/100	1/10	13/100
25	1/40	1/4	33/100 (or 1/3)
40	1/25	2/5	1/2
60	3/50	3/5	4/5
100	1/10	1	1-1/3
150	3/20	1-1/2	2
200	1/5	2	2-2/3
300	3/10	3	4
500	1/2	5	6-2/3
750	3/4	7-1/2	10
1000	1	10	13-1/3
1500	1-1/2	15	20
2000	2	20	26-2/3
5000	5	50	66-2/3

Source: Thomas Alva Edison Foundation

Figure 1.4 lists a sampling of household appliances and the estimated kilowatt hours consumed monthly in using the appliance.

Appliances in use today are larger and more sophisticated than those of the past. Compare, for instance, the size of refrigerators 20 years ago to the size of refrigerators today. Today's refrigerators are built larger, have more features, and, consequently use more energy. The two major uses of appliances in the home -- after heating and cooling and hot water heating -- are refrigeration and food preparation or cooking. When purchasing one of these major appliances the customer should not select one larger than needed to meet his or her requirements. Once purchased, care should be taken to keep the appliance maintained and in top working order.

Using the list in Figure 1.4, inventory your home for the number of appliances in use and add up the total monthly kilowatt hour appliance usage. Based on kilowatt hour cost for electricity in your area, estimate the monthly and yearly operating cost of each appliance.

For appliances not listed in Figure 1.4, find the wattage for that appliance stamped on its registration plate, determine the kilowatt hour energy consumption from Figure 1.3, estimate the monthly and annual hourly usage of the appliance, and add it to your list in Figure 1.4.

FIGURE 1.4

HOUSEHOLD APPLIANCES

	AVERAGE WATTAGE	EST. KWH CONSUMED MONTHLY
FOOD PREPARATION		
BLENDER	300	0.1
BROILER	1,140	7
CARVING KNIFE	92	0.1
COFFEE MAKER	1,000	1.0
CREPE MAKER	894	9
DEEP FRYER	1,448	7
DISHWASHER (2 LOADS)	1,201	30
DOUBLE HAMBURGER MAKER	750	.75
EGG COOKER	516	1
FOOD PROCESSOR	360	.17
FRYING PAN	1,196	8
HOT PLATE	1,200	8
MIXER	127	0.2
OVEN, MICROWAVE (ONLY)	1,450	16
RANGE		
WITH OVEN	12,200	98
WITH SELF-CLEANING OVEN	12,200	100
ROASTER	1,333	5
TRASH COMPACTOR	400	2
WAFFLE IRON	1,200	2
WASTE DISPENSER	445	2

SOURCE: TEXAS POWER AND LIGHT

FIGURE 1.4 (CONT.)

	AVERAGE WATTAGE	EST. KWH CONSUMED MONTHLY
FOOD PRESERVATION		
FREEZER (15-21 FT.)		
CHEST TYPE, MANUAL DEFROST	-	110
UPRIGHT TYPE		
MANUAL DEFROST	-	110
AUTOMATIC DEFROST	-	165
REFRIGERATORS/FREEZERS		
MANUAL DEFROST, 10-15 CU. FT.	-	58
AUTOMATIC DEFROST, 16-18 CU. FT.	-	150
AUTOMATIC DEFROST, 20 CU. FT. & UP	-	158

FOOD PRESERVATIONS -- THE WATTAGE AND CONSUMPTION OF FREEZERS AND REFRIGERATORS VARY ACCORDING TO MAKE AND SIZE. ADDITIONALLY, THE ELECTRICAL CONSUMPTION IS AFFECTED BY MANY VARIABLES: FAMILY SIZE, USAGE, ENVIRONMENT, ETC. THE TABLE ABOVE IS MERELY AN ESTIMATE BASED ON AVERAGE EQUIPMENT AND USAGE. MORE DETAILED INFORMATION ABOUT YOUR PARTICULAR APPLIANCE CAN BE OBTAINED THROUGH THE LOCAL TEXAS POWER & LIGHT COMPANY OFFICE.

SOURCE: TEXAS POWER AND LIGHT

FIGURE 1.4 (CONT.)

	AVERAGE WATTAGE	EST. KWH CONSUMED HOURLY
COMFORT CONDITIONING		
AIR CLEANER	50	.05
AIR CONDITIONER (ROOM) 12,000 BTU	1,600	1.6
BED COVERING	177	.177
DEHUMIDIFIER	257	.257
FAN (ATTIC)	370	.370
FAN (CIRCULATING)	88	.088
FAN (ROLLAWAY)	171	.171
FAN (WINDOW)	200	.200
FURNACE FAN	500	.500
HEATER (PORTABLE)	1,322	1.322
HEATING PAD	65	.065
HUMIDIFIER	177	.177

COMFORT CONDITIONING -- SINCE THE TYPE AND SIZE OF COMFORT CONDITIONING EQUIPMENT IS WIDELY VARIED, ELECTRICAL CONSUMPTION DIFFERS GREATLY FROM ONE INSTALLATION TO ANOTHER. FOR DETAILED INFORMATION ABOUT YOUR EQUIPMENT, ITS USE AND CONSUMPTION, CONTACT THE LOCAL TEXAS POWER & LIGHT COMPANY OFFICE. THE ABOVE LISTINGS ARE ONLY AVERAGES AND ESTIMATES.

SOURCE: TEXAS POWER AND LIGHT

FIGURE 1.4 (CONT.)

	WATTAGE AVERAGE	EST. KWH CONSUMED MONTHLY
LAUNDRY		
CLOTHES DRYER (8 LOADS PER WEEK)	4,856	83
IRON (HAND)	1,100	5
WASHING MACHINE (AUTOMATIC)	512	9
WASHING MACHINE (NON-AUTOMATIC)	286	6
WATER HEATER	4,500	300-500

SOURCE: TEXAS POWER AND LIGHT

FIGURE 1.4 (CONT.)

	AVERAGE WATTAGE	EST. KWH CONSUMED MONTHLY
HEALTH & BEAUTY		
GERMICIDAL LAMP	20	12
HAIR DRYER	1,000	15
HEAT LAMP (INFRARED)	250	1
SHAVER	15	.004
SUN LAMP	275	1
TOOTH BRUSH	1.1	.1
VIBRATOR	40	.2
HOME ENTERTAINMENT		
RADIO (SOLID STATE)	10	1
RADIO/RECORD PLAYER	109	9
TELEVISION		
BLACK & WHITE		
TUBE TYPE	100	18
SOLID STATE	45	8
COLOR		
TUBE TYPE	240	44
SOLID STATE	145	27
HOUSEWARES		
CLOCK	2	1.4
FLOOR POLISHER	305	1
SEWING MACHINE	75	1
VACUUM CLEANER	630	4

SOURCE: TEXAS POWER AND LIGHT

A. REFRIGERATOR/FREEZER

One of the greatest sources of wasted electricity in a refrigerator or freezer is frost collecting on the evaporator unit. When excessive frost accumulates, the appliance has to run for longer periods of time to cool food. This results in wasted energy.

Defrosting should be done before the ice builds up more than 1/2 inch. Manual defrosting is not an easy chore, but should be done periodically to prolong life of the refrigerator and to cut down on energy use.

LABORATORY

Most thermostats in refrigerators and freezers last the lifetime of the appliance. Thermostats can be checked, however, with the use of a thermometer. Place the thermometer on the middle shelf of the compartment and make sure it is not touching any of the food. Close the door and wait 30 minutes. Check the thermometer after waiting. If the temperature is higher or lower than 40° adjust the temperature setting on the thermostat accordingly. Once satisfied with the temperature

Frost-free refrigerators and freezer use more energy for this time saving device but eliminate the task of defrosting manually. Frost-free units have an automatic time clock which periodically turns the cooling unit off and turns on heater strips to melt the ice build-up on the evaporator coils. The heater remains on long enough to melt the frost and ice which then drains into a pan under the condenser.

The refrigerator should be set on 38° to 40° for the refrigerator compartment and 5° for the freezer section on a refrigerator/freezer combination. Lower settings waste energy by increasing frost build-up; higher settings will save energy but will not keep food properly, thus defeating the purpose of the refrigerator. Separate freezers used to keep food for long periods of time should be set at 0°.

of the compartment remember the control setting for future reference.

Do not hold the door to the unit open for long periods of time. Holding the door open increases frost build-up and reduces efficiency because the warm air entering the unit must be cooled. Check the gasket and seal of the unit periodically. A defective or torn door gasket will allow cool air to escape and warm air to enter the unit. Placing hot food in the refrigerator or freezer compartment also increases frost build-up and forces the unit to remove excess heat.

Place a thermometer inside the refrigerator, close the door, and wait about 15 minutes for the thermometer to reach the inside temperature. Open the door and read the inside temperature. It will probably be about 40°F.

Unplug the refrigerator's power cord from the wall outlet. Keep the door closed for exactly 15 minutes. Open the door and take a temperature reading. The temperature should not have changed.

Plug the refrigerator back in and wait another 15 minutes. Now, unplug the refrigerator again, and repeat the experiment, but every five minutes open the door for about 30 seconds. Check the thermometer after 15 minutes. That's right! The temperature should have risen by several degrees. Explain why.

Usually the refrigerator automatically switches on when warm air enters it, but it has been unplugged to prevent the unit from working.

Keep the condenser well ventilated and clean from dirt and lint build-up. The condenser coil located at the back or on the bottom of the unit allows heat to escape the refrigerator unit. Dust accumulation reduces this condensation and interferes with heat transfer from the coils into the surrounding air. Clean these coils at least twice a year. This could save as much as one dollar a year on refrigerator operating costs.

Do not block the condenser coils by restricting air circulation. Place the unit away from the wall with no cabinet overhang to interfere with condenser coil fans or air circulation.

A recent feature introduced on refrigerators and freezers is the power-saver switch. Most refrigerators have heating elements in the walls or doors to prevent sweating or humidity build-up on the outside. In most climates the heating element does not need to be working all the time. The power-saver switch turns off the heating element in dry climatic conditions. By using the power--saver switch, 16% of refrigerator energy costs can be saved.

Another item which needs consideration for efficient operation for a refrigerator or freezer is proper wiring. A freezer or refrigerator requires a great deal of electrical current when it first starts up. This sudden surge of power is usually 3 to 4 times as much as is required when it is running. Refrigerators require 15 or 20 amps circuits to prevent the brief surges of power from blowing a fuse or circuit breaker. In addition to providing proper circuits, only one

Plug the refrigerator back in as before, and wait 30 minutes before you continue the experiment. Meanwhile, fill a bowl or pot with hot water from the kitchen faucet.

After 30 minutes, unplug the refrigerator and place the bowl of water inside. Close the door. In 15 minutes take a temperature reading.

The temperature will have risen several degrees. Explain why.

Check the seal of the unit by closing the door over a dollar bill or a piece of paper so that half of it sticks outside the refrigerator and half remains inside. Pull on the bill. If it pulls out easily, the latch may need adjustment or the seal may need replacing.

large appliance should be plugged into a single circuit. When two or more large appliances -- refrigerators, freezers, toaster ovens, irons, grills, microwave ovens -- are plugged into the same circuit, the efficiency of the two operating at the same time can be reduced greatly and the energy usage strained. This results in the motor working harder for longer periods of time and shortens the life of the motor. The cord on a freezer or refrigerator is seldom longer than 5 or 6 feet. If an extension cord must be used, be sure to use a heavy gauge cord. Most inexpensive extension cords are made of 16-gauge wire which is too small for large appliances. Even 14-gauge wire is too small if the distance from outlet to unit is more than 10 feet. Therefore, it is recommended that 12-gauge wire be used for appliances if the extension cord is longer than 10 feet, and that 14-gauge wire be used for shorter distances. Always use grounded wire and outlets to prevent possible shock.

A. COOKING

The Department of Energy has outlined several tips and energy saving ideas for cooking.

Use cold water rather than hot to operate your food disposer. This saves the energy needed to heat the water, is recommended for the appliance, and aids in getting rid of grease. Grease solidifies in cold water and can be ground up and washed away.

Install an aerator in your kitchen sink faucet. By reducing the amount of water in the flow, you use less hot water and save the energy that would have been required to heat it. The lower flow pressure is hardly noticeable.

LABORATORY

Can you think of other energy saving tips for cooking?

Compare the advantages and disadvantages of using a gas range and oven or an electric range and oven in your area. Compare costs. (The KWH usage on electric ranges and the CCF for gas ranges are written on their registration plates.)

What are the advantages or disadvantages of using a conventional electric range to

If you need to purchase a gas oven or range, look for one with an automatic (electronic) ignition system instead of pilot lights. You'll save an average of up to 47 percent of your gas use -- 41 percent in the oven and 53 percent on the top burners.

If you have a gas stove, make sure the pilot light is burning efficiently -- with a blue flame. A yellowish flame indicates an adjustment is needed.

Never boil water in an open pan. Water will come to a boil faster and use less energy in a kettle or covered pan.

Keep range-top burners and reflectors clean. They will reflect the heat better, and you will save energy.

Match the size of pan to the heating element. More heat will get to the pan; less will be lost to surrounding air.

If you cook with electricity, get in the habit of turning off the burners several minutes before the allotted cooking time. The heating element will stay hot long enough to finish the cooking for you without using more electricity.

When using the oven, make the most of the heat from that single source. Cook as many foods as you can at one time. Prepare dishes that can be stored or frozen for later or make all oven-cooked meals.

Watch the clock or use a timer; don't continually open the oven door to check food. Every time you open the door heat escapes and your cooking takes more energy.

Use small electric pans or ovens for small meals rather than the kitchen range or oven. They use less energy.

perform several tasks versus a variety of smaller appliances, i.e. a small deep fryer, an electric hot dogger, a toaster oven, an electric water kettle?

Use pressure cookers and microwave ovens if you have them. They can save energy by reducing cooking time.

C. DISHWASHER

The average dishwasher uses 14 gallons of hot water per load. Since the hot water supplied by the home hot water heater is rarely hot enough to sterilize the dishes, a heating element is built in to heat the water to approximately 180°F. After the dishes have been washed and rinsed, this heating element is used to dry the dishes. This means a dishwasher costs the customer twice: once to heat water in the hot water tank, and once in the dishwasher itself to heat the water to a temperature for sterilization. It becomes very important to utilize this appliance efficiently by monitoring its use and insuring it is in good working order.

When installing the dishwasher, size the electric wire properly with the current requirements, as discussed above for refrigerators and freezers.

Insure that hose and water connections are the proper size for the unit so that undue stress and strain on cycle operation does not occur. Proper fittings will reduce wear and prolong the life of the machine.

Clean the food screen often to avoid unnecessary drain clog. If the drain becomes blocked, the motor may overheat causing serious problems.

Check the instructions for the proper water level. If the water level is not set properly, the operation of the spray and spinner will be interfered with.

The average dishwasher uses 14 gallons of hot water per load. Use it energy efficiently.

Be sure your dishwasher is full, but not overloaded, when you turn it on.

When buying a dishwasher, look for a model with air-power and/or overnight dry settings. These features automatically turn off the dishwasher after the rinse cycle. This can save you up to one-third of your total dishwashing energy costs.

Let your dishes air dry. If you don't have an automatic air-dry switch, turn off the control knob after the final rinse. Prop the door open a little and the dishes will dry faster.

Don't use the "rinse hold" on your machine. It uses 3 to 7 gallons of hot water each time you use it.

Scrape dishes before loading them into the dishwasher so you won't have to rinse them. If they need rinsing, use cold water.

If every dishwasher user in the country cut out just one load a week, we'd save almost 15 million kilowatt-hours of electricity every day or the equivalent of about 9,000 barrels of oil a day.

D. WASHING MACHINE

The washing machine is an important appliance to the American family. It uses both hot water and electricity when it operates, and can waste energy needlessly if the water supply is clogged or if the motor is not properly adjusted.

Periodic inspections or routine maintenance can prolong the life of a washing machine and insure that it is operating most efficiently. Check the motor about once a year. Look for broken or cracked V-belts, defective electrical wiring, oil leaks, and loose connections. Check the hoses and drains to make sure they are not crimped or cracked and are properly tightened. Unscrew the connecting hoses and clean the hose screens of rust particles, dirt, and other obstructions. Remember, a washing machine vibrates during its cycle. This vibration could cause something to work loose and cause it to operate at less than full efficiency.

There are everyday measures to take in using washers which will yield energy savings. First, be conservative with hot water. Second, use the water less frequently by combining or saving up small loads of laundry and making them into larger loads. The Department of Energy suggests other energy saving tips:

You can save considerable amounts of energy in the laundry through conservation of hot water and by using your automatic washers and dryers less often and more efficiently.

Wash clothes in warm or cold water, rinse in cold. You'll save energy and money. Use hot water only if absolutely necessary.

Fill washers (unless they have small-load attachments or variable water levels), but do not overload them.

Use the suds saver if you have one. It will allow you to use one tubful of hot water for several loads.

Don't use too much detergent. Follow the instructions on the box. Oversudsing makes your machines work harder and use more energy.

Pre-soak or use a soak cycle when washing heavily soiled garments. You'll avoid two washings and save energy.

E. CLOTHES DRYER

Clothes dryers are either all-electric or gas with an electric motor. The purpose of the dryer is to evaporate the water held in wet clothes. This is done by air passing over the clothes and out the vent. Electric dryers use a heating element to warm the air drawn into the dryer. Gas dryers use heated exhaust gas, ignited by an electric spark or hot-wire starter, to dry the clothes. A series of thermostats monitor the temperature of the air entering and leaving the dryer controls. Some dryers have an electronic humidity sensor which determines when the clothes reach a desired amount of dryness. This sensor controls the temperature of the dryer so the clothes will not wrinkle.

Once the moisture has evaporated from the clothes the dryer will be wasting energy if it is allowed to continue operating. The timer should be set to coincide as closely as possible with the actual amount of time required to dry the clothes.

Clothes dryers often have several drying temperatures and a variety of time settings for various materials. The correct combination of time and temperature setting for certain fabrics gives the most efficient use of the required energy. To accomplish this requires practice and some experimenting.

LABORATORY

Put a load of clothes in the dryer, and begin watching the clock. After fifteen minutes, open the dryer door, and feel the clothes. They will probably still be damp. Close the door, and restart the dryer.

Do this again every five minutes <u>until</u> the clothes feel dry to the touch. Look at the timer and see how much longer the dryer was set to run. If the dryer is electric, every wasted minute burned up about 4/5-ounce of oil (or one ounce of coal) at the power company. If the dryer runs on gas, every wasted minute burns about 1/10 cubic feet of gas. Multiply this by the number of dryer loads a year to get the annual amount of wasted energy <u>you</u> pay for.

Below are some energy saving tips for efficient operation of clothes dryers.

Fill clothes dryers but do not overload them.

Keep the lint screen in the dryer clean. Remove lint after each load. Lint impedes the flow of air in the dryer and requires the machine to use more energy.

Keep the outside exhaust of your clothes dryer clean. Check it regularly. A clogged exhaust lengthens the drying time and increases the amount of energy used.

If your dryer has an automatic dry cycle, use it. Overdrying merely wastes energy.

Dry your clothes in consecutive loads. Stop-and-start drying uses more energy because a lot goes into bringing the dryer up to the desired temperature each time you begin.

Separate drying loads into heavy and lightweight items. Since the lighter ones take less drying time, the dryer doesn't have to be on as long for these loads.

If drying the family wash takes more than one load, leave small, lightweight items until last. You may be able to turn off the power and dry them with heat retained by the machine from earlier loads.

Save energy by using the old-fashioned clothesline. As a bonus, clothes dried outdoors often seem fresher and cleaner than those taken from a mechanical dryer.

F. MINOR APPLIANCES

The appliances discussed up to this point have been major appliances which serve a necessary function in the home. The energy-saving tips have included

maintenance for efficient operation and selective use. In addition to major appliances there are approximately 30 small electric appliances which make the work at home convenient. Some of these "gadgets" are necessary and helpful, but others are more convenient than efficient and waste a great deal of energy. Some small appliances could be eliminated by substituting simple human energy as a power source rather than electrical energy. This topic is controversial and individuals will argue the merit of some small appliances over the alternate of manual labor. The point still exists, however, that the appliances costs money to operate. Is the user of the product willing or prepared to pay the price to operate them?

Figure 1.5 lists some small appliances which could be eliminated by substituting non-energy consuming means. The annual amount of kilowatt-hours consumed by each appliance is also listed.

Some of these figures are not large. Others add up substantially. The use of such appliances adds to the 33% total world energy used by the 6% of the world population which lives in the United States.

LABORATORY

From the lists made from Figures 1.3 and 1.4, identify those appliances you feel are unnecessary. How frequently are they used? Can you determine how much energy and money can be saved by eliminating them?

FIGURE 1.5

ELIMINATING UNNECESSARY APPLIANCES

Electric Appliances	Kilowatt Hours Consumed Annually	Substitute
Blender	15	egg beater and strong arm
Carving knife	8	sharp knife
Coffee maker	106	do without
Dishwasher	363	wash dishes by hand
Egg cooker	14	cook eggs in boiling water used for tea or coffee
Garbage disposal	30	compost food waste
Trash compactor	50	manually shred trash and crush cans
Clothes dryer	993	hang clothes to dry outside in summer and inside in winter (to help humidify)
Iron	144	wear permanent-press clothing
Electric blanket	147	sleep with extra blankets
Humidifier	163	put a pan of water on the radiator, hang up wet clothes, or open the bathroom door after a shower
Portable heater	176	heavier clothing
Hair dryer	14	dry towel, strong arms
Germicidal lamp	141	do without
Sun lamp	16	go outside and enjoy the sunshine
Shaver	1.8	grow a beard
Toothbrush	.5	brush by hand
Vibrator	2	physical exercise
Clock	17	wind-up clock
Can opener		manual can opener
Lawn mower		hand-powered mower
Hedge clipper		hand-powered clipper
Saw		hand-powered saw
Paint mixer		hand-powered mixer

Source: Center for Science in the Public Interest

G. APPLIANCE ENERGY CONSERVATION TIPS

To summarize tips on how to save energy when buying or using appliances, here are a few general ideas to consider from the Department of Energy.

Don't leave your appliances running when they're not in use. It's a total waste of energy. Remember to turn off your radio, TV, or record player when you leave the room.

Keep appliances in good working order so they will last longer, work more efficiently, and use less energy.

When buying appliances, comparison shop. Compare energy use information and operating costs of similar models by the same and different manufacturers. The retailer should be able to help you find the wattage of the appliance. With that information you should be able to figure out how much it will cost you to run the appliance you choose.

Before buying new appliances with special features, find out how much energy they use compared with other, perhaps less convenient, models. A frost-free refrigerator, for example, uses more energy than one you have to defrost manually. It also costs more to purchase. The energy and dollars you can save with a manual-defrost model may be worth giving up the convenience.

Use appliances wisely; use the one that takes the least amount of energy for the job. For example: toasting bread in the oven uses three times more energy than toasting it in a toaster.

Don't use energy-consuming special features on your appliances if you have an alternative. For example, don't use the "instant-on" feature of your TV set. "Instant-on" sets, especially the tube types, use energy even when the screen is dark. Use the "vacation switch," if you have one, to eliminate this waste; plug the set into an outlet that is controlled by a wall switch; or have your TV serviceman install an additional on-off switch on the set itself or in the cord to the wall outlet.

MODULE #7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

UNIT 2

THE APPLIANCE LABELING PROGRAM

OBJECTIVES: Upon completion of this unit the student will be able to:

1. Discuss the appliance labeling program established by Congress.

2. Discuss the advantages and disadvantages of the Federal Trade Commission's labeling program.

LECTURE

On December 22, 1975, the Energy Policy and Conservation Act signed a law that established a labeling program designed to help consumers shop for energy-saving household appliances and equipment. The Federal Trade Commission and the Department of Energy are developing the procedures for appliance testing, labeling, and public information required by this law. These procedures and appliance labels will begin showing on the market in the fall of 1979.

The program is aimed at a variety of appliances that together account for roughly 90 percent of the energy used in the home. The appliances include clothes dryers, washing machines, refrigerators, freezers, ranges, television sets, humidifiers, water heaters, furnaces, dishwashers, and air-conditioners.

Eventually, the program will have a direct effect on the design of appliances, since the Department of Energy will set mandatory energy-efficiency standards. At first, however, the program affects only the way

appliances are advertised and marketed and will require appliances to carry a label listing annual energy costs.

As proposed, the labels would highlight the estimated annual operating cost for each appliance brand and model. The estimate would be based on national average range of energy prices and on patterns of "typical" use. Finally, a chart would show how a specific model's energy cost compares with that of competing models. This would be followed by a disclaimer noting that actual costs will vary.

A sample energy label, as proposed by the FTC in July 1978, is at Figure 2.1 below. Some of the labels are small and reasonably straightforward, but others -- notably those for humidifiers -- are very elaborate.

FIGURE 2.1

FEDERAL TRADE COMMISSION'S PROPOSED APPLIANCE LABEL

BEFORE BUYING

COMPARE ENERGY COSTS

CHECK ENERGY COST

How much will your yearly cost be with this model? How does it compare with other models? Check the figures and spend less on energy.

Help the nation conserve energy

(1) ESTIMATED YEARLY COST OF THIS MODEL

$8

(3) MORE COST INFORMATION

The $8 estimate for this model is based on the 1977 national average gas rate of 20.7¢ per therm (100 CF) and 8 loads of clothes per week.

COMPARE ENERGY COSTS

Brands and models of standard size gas clothes dryers have different yearly energy costs:

(2)

Model with lowest energy cost		Model with highest energy cost
$7	$8	$10
	This Model	

(3) Check this table to estimate your yearly cost:

	Cost per therm				
	15¢	20¢	25¢	30¢	35¢
Loads of 2	$2	$2	$3	$3	$3
clothes 4	$3	$4	$5	$6	$7
per week 6	$5	$7	$8	$9	$10
8	$7	$9	$10	$13	$14
12	$10	$13	$16	$18	$21

WARNING

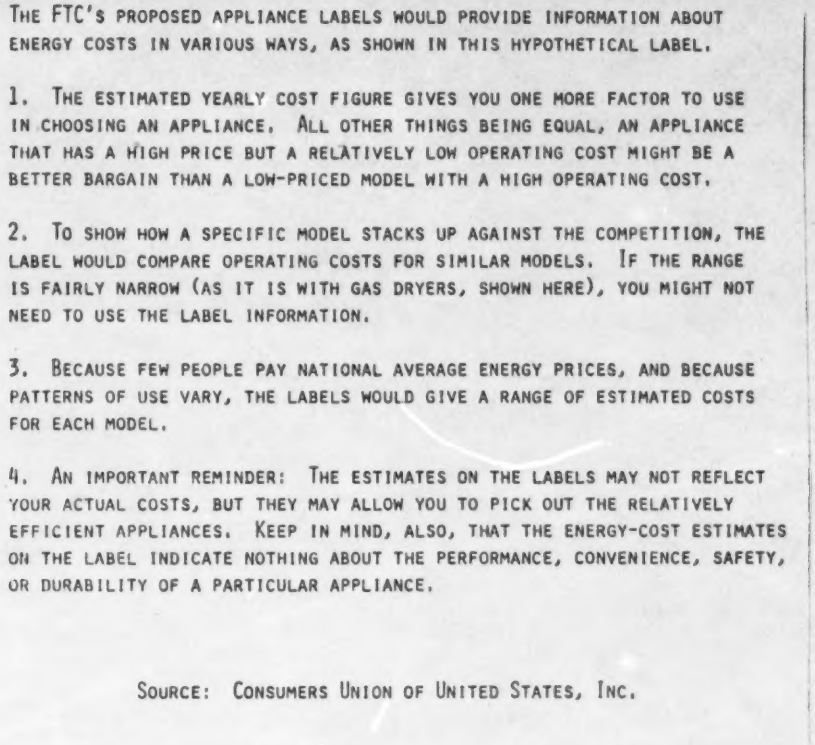
Removal of this lable before consumer purchase is a violation of federal law. (42 U.S.C. 6302)

(4) SOURCE OF COST INFORMATION

Estimates are based on U.S. Government standard tests. Your cost will depend on your utility rate and how you use the product.

FIGURE 2.1

FEDERAL TRADE COMMISSION'S PROPOSED APPLIANCE LABEL


THE FTC'S PROPOSED APPLIANCE LABELS WOULD PROVIDE INFORMATION ABOUT ENERGY COSTS IN VARIOUS WAYS, AS SHOWN IN THIS HYPOTHETICAL LABEL.
1. THE ESTIMATED YEARLY COST FIGURE GIVES YOU ONE MORE FACTOR TO USE IN CHOOSING AN APPLIANCE. ALL OTHER THINGS BEING EQUAL, AN APPLIANCE THAT HAS A HIGH PRICE BUT A RELATIVELY LOW OPERATING COST MIGHT BE A BETTER BARGAIN THAN A LOW-PRICED MODEL WITH A HIGH OPERATING COST.
2. TO SHOW HOW A SPECIFIC MODEL STACKS UP AGAINST THE COMPETITION, THE LABEL WOULD COMPARE OPERATING COSTS FOR SIMILAR MODELS. IF THE RANGE IS FAIRLY NARROW (AS IT IS WITH GAS DRYERS, SHOWN HERE), YOU MIGHT NOT NEED TO USE THE LABEL INFORMATION.
3. BECAUSE FEW PEOPLE PAY NATIONAL AVERAGE ENERGY PRICES, AND BECAUSE PATTERNS OF USE VARY, THE LABELS WOULD GIVE A RANGE OF ESTIMATED COSTS FOR EACH MODEL.
4. AN IMPORTANT REMINDER: THE ESTIMATES ON THE LABELS MAY NOT REFLECT YOUR ACTUAL COSTS, BUT THEY MAY ALLOW YOU TO PICK OUT THE RELATIVELY EFFICIENT APPLIANCES. KEEP IN MIND, ALSO, THAT THE ENERGY-COST ESTIMATES ON THE LABEL INDICATE NOTHING ABOUT THE PERFORMANCE, CONVENIENCE, SAFETY, OR DURABILITY OF A PARTICULAR APPLIANCE.

SOURCE: CONSUMERS UNION OF UNITED STATES, INC.

The labels are intended to allow the customer to compare operating costs as well as price when shopping for an appliance. Government officials hope the labels will thereby add an extra element of competition to the marketplace, prodding manufacturers to design products that are more energy-efficient.

The appliance industry is far from pleased with the FTC's labeling regulations. Many manufacturers believe that the figures on the labels could mislead consumers because no two homes use an appliance in the same way and because utility rates are changing. Therefore, it is impossible to set any meaningful estimate for the cost of operation. Others are concerned that the promotional

exploitation of data based on the energy testing program may lead some people to believe that the appliances have been tested for performance, convenience, safety, durability, or some other factor not involved with energy. In addition, some critics claim the labels will not help much because the operating cost figures will vary only slightly from one appliance to another. Therefore, labels will be most useful when they show a fairly wide range of energy costs.

In addition to labels and advertising, the Government is taking a direct approach to energy conservation by imposing mandatory minimum efficiency standards on the appliance industry. The standards, which should be put in final form within three years, will supplant a set of voluntary "improvement targets" mandated by the 1975 energy law.

Many industry representatives may have to stop making certain appliance models if the standards are too difficult or costly to meet. However, the disappearance of inefficient appliances should still leave plenty of room for consumer choice.

The upcoming Government standards, along with the labeling program, are likely to mean higher list prices for appliances. Exactly how much higher is not certain at this point, but some early Department of Energy estimates show design changes called for under the voluntary target program will have added about $45 to the price of a refrigerator, for example, and about $60 to the price of a room air-conditioner. In theory, however, the customer could recover such price increases through lower annual operating costs, assuming the efficiency improvements do not shorten the useful life of the product or increase the need to service it.

MODULE #7

APPLIANCE ENERGY CONSERVATION OPPORTUNITIES

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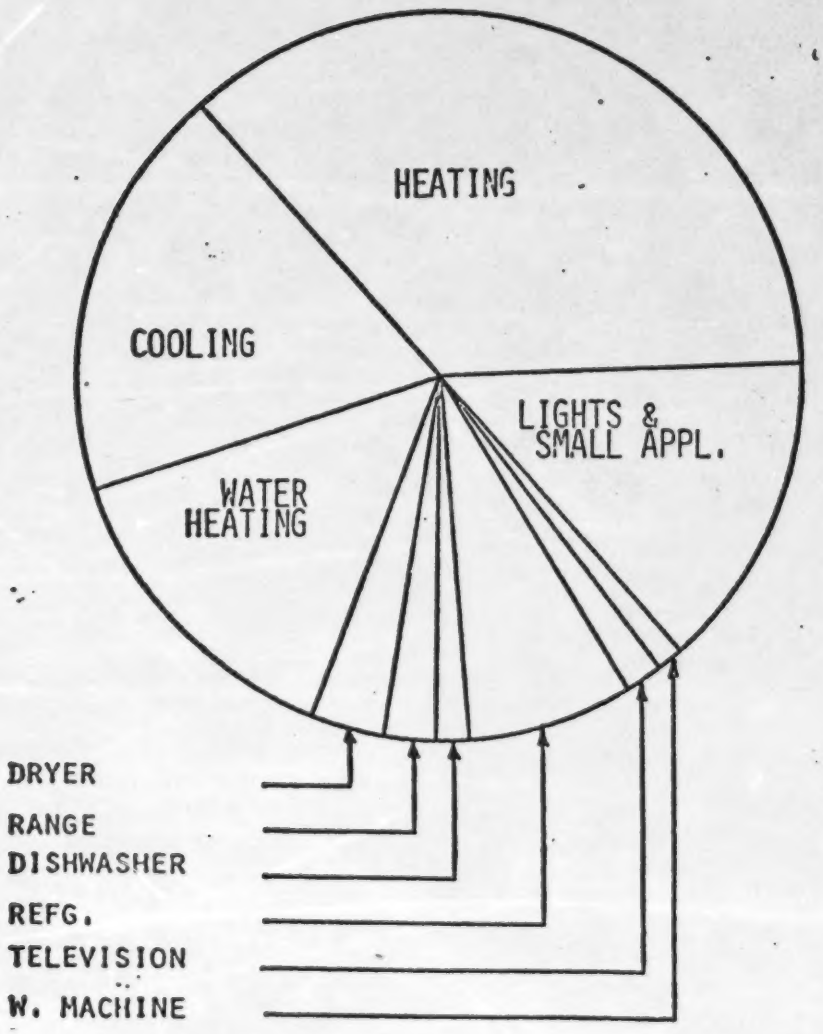
FIGURE 1.1

AVERAGE ANNUAL KWH
BY APPLIANCE



SOURCE: Texas Power and Light Company

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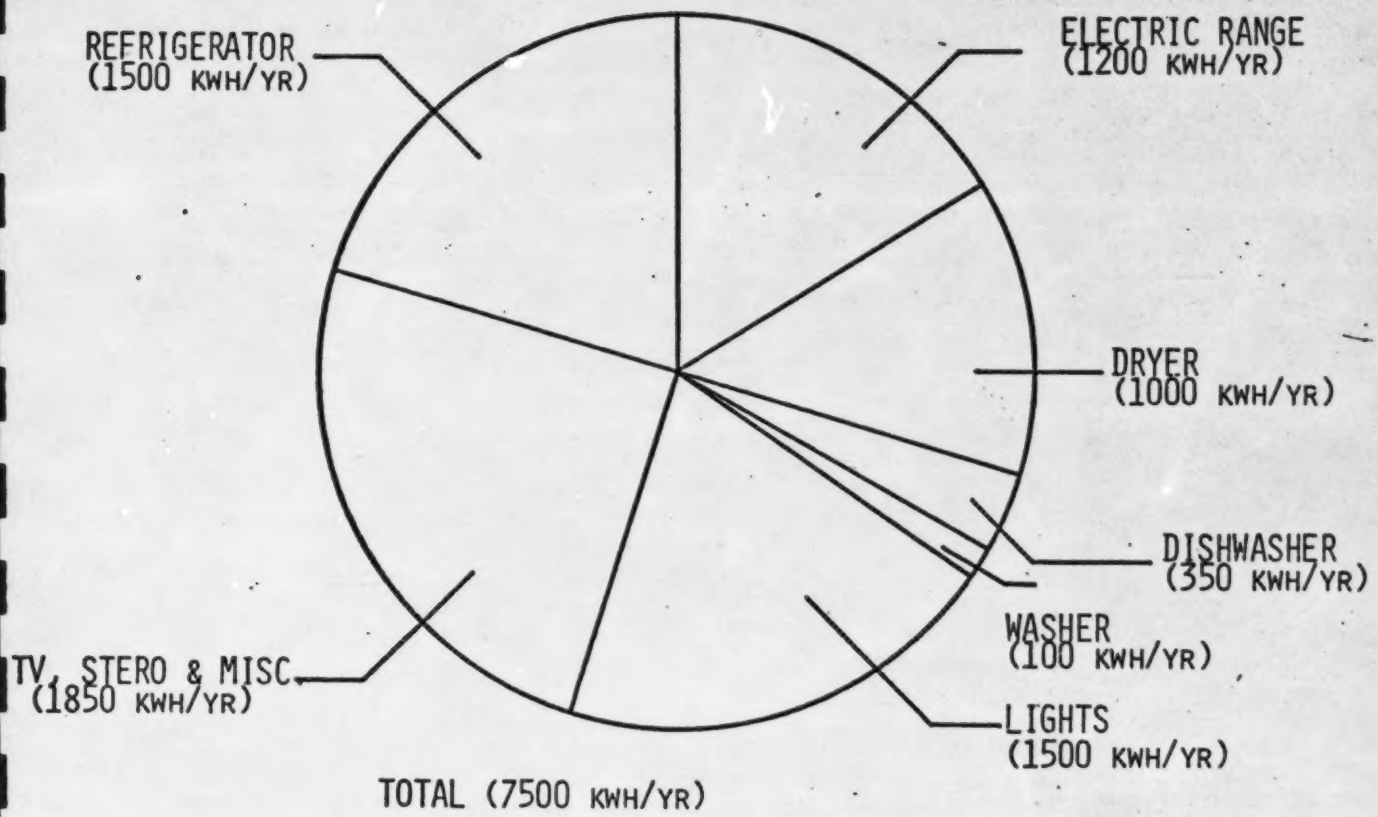
FIGURE 1.2 APPLIANCE AND LIGHTING ENERGY FOR A TYPICAL FOUR-PERSON FAMILY



TOTAL (7500 KWH/YR)

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FIGURE 1.3

ELECTRICAL APPLIANCE ENERGY TABLE

Appliance Wattage Rating	Kilowatt-Hours of Energy Used Per Hour	Ounces of Oil Burned Per Hour	Ounces of Coal Burned Per Hour
10	1/100	1/10	13/100
25	1/40	1/4	33/100 (or 1/3)
40	1/25	2/5	1/2
60	3/50	3/5	4/5
100	1/10	1	1-1/3
150	3/20	1-1/2	2
200	1/5	2	2-2/3
300	3/10	3	4
500	1/2	5	6-2/3
750	3/4	7-1/2	10
1000	1	10	13-1/3
1500	1-1/2	15	20
2000	2	20	26-2/3
5000	5	50	66-2/3

Source: Thomas Alva Edison Foundation

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FIGURE 1.4

HOUSEHOLD APPLIANCES

	AVERAGE WATTAGE	EST. KWH CONSUMED MONTHLY
FOOD PREPARATION		
BLENDER	300	0.1
BROILER	1,140	7
CARVING KNIFE	92	0.1
COFFEE MAKER	1,000	1.0
CREPE MAKER	894	9
DEEP FRYER	1,448	7
DISHWASHER (2 LOADS)	1,201	30
DOUBLE HAMBURGER MAKER	750	.75
EGG COOKER	516	1
FOOD PROCESSOR	360	.17
FRYING PAN	1,196	8
HOT PLATE	1,200	8
MIXER	127	0.2
OVEN, MICROWAVE (ONLY)	1,450	16
RANGE		
WITH OVEN	12,200	98
WITH SELF-CLEANING OVEN	12,200	100
ROASTER	1,333	5
TRASH COMPACTOR	400	2
WAFFLE IRON	1,200	2
WASTE DISPENSER	445	2

SOURCE: TEXAS POWER AND LIGHT

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FIGURE 1.4 (CONT.)

FOOD PRESERVATION	AVERAGE WATTAGE	EST. KWH CONSUMED MONTHLY
FREEZER (15-21 FT.)		
CHEST TYPE, MANUAL DEFROST	-	110
UPRIGHT TYPE		
MANUAL DEFROST	-	110
AUTOMATIC DEFROST	-	165
REFRIGERATORS/FREEZERS		
MANUAL DEFROST, 10-15 CU. FT.	-	58
AUTOMATIC DEFROST, 16-18 CU. FT.	-	150
AUTOMATIC DEFROST, 20 CU. FT. & UP	-	158

FOOD PRESERVATIONS -- THE WATTAGE AND CONSUMPTION OF FREEZERS AND REFRIGERATORS VARY ACCORDING TO MAKE AND SIZE. ADDITIONALLY, THE ELECTRICAL CONSUMPTION IS AFFECTED BY MANY VARIABLES: FAMILY SIZE, USAGE, ENVIRONMENT, ETC. THE TABLE ABOVE IS MERELY AN ESTIMATE BASED ON AVERAGE EQUIPMENT AND USAGE. MORE DETAILED INFORMATION ABOUT YOUR PARTICULAR APPLIANCE CAN BE OBTAINED THROUGH THE LOCAL TEXAS POWER & LIGHT COMPANY OFFICE.

SOURCE: TEXAS POWER AND LIGHT

30

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FIGURE 1.4 (CONT.)

	AVERAGE WATTAGE	EST. KWH CONSUMED HOURLY
COMFORT CONDITIONING		
AIR CLEANER	50	.05
AIR CONDITIONER (ROOM)		
12,000 BTU	1,600	1.6
BED COVERING	177	.177
DEHUMIDIFIER	257	.257
FAN (ATTIC)	370	.370
FAN (CIRCULATING)	88	.088
FAN (ROLLAWAY)	171	.171
FAN (WINDOW)	200	.200
FURNACE FAN	500	.500
HEATER (PORTABLE)	1,322	1.322
HEATING PAD	65	.065
HUMIDIFIER	177	.177

COMFORT CONDITIONING -- SINCE THE TYPE AND SIZE OF COMFORT CONDITIONING EQUIPMENT IS WIDELY VARIED, ELECTRICAL CONSUMPTION DIFFERS GREATLY FROM ONE INSTALLATION TO ANOTHER. FOR DETAILED INFORMATION ABOUT YOUR EQUIPMENT, ITS USE AND CONSUMPTION, CONTACT THE LOCAL TEXAS POWER & LIGHT COMPANY OFFICE. THE ABOVE LISTINGS ARE ONLY AVERAGES AND ESTIMATES.

SOURCE: TEXAS POWER AND LIGHT

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FIGURE 1.4 (CONT.)

	AVERAGE WATTAGE	EST. KWH CONSUMED MONTHLY
HEALTH & BEAUTY		
GERMICIDAL LAMP	20	12
HAIR DRYER	1,000	15
HEAT LAMP (INFRARED)	250	1
SHAVER	15	.004
SUN LAMP	275	1
TOOTH BRUSH	1.1	.1
VIBRATOR	40	.2
HOME ENTERTAINMENT		
RADIO (SOLID STATE)	10	1
RADIO/RECORD PLAYER	109	9
TELEVISION		
BLACK & WHITE		
TUBE TYPE	100	18
SOLID STATE	45	8
COLOR		
TUBE TYPE	240	44
SOLID STATE	145	27
HOUSEWARES		
CLOCK	2	1.4
FLOOR POLISHER	305	1
SEWING MACHINE	75	1
VACUUM CLEANER	630	4

SOURCE: TEXAS POWER AND LIGHT

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FIGURE 1.4 (CONT.)

LAUNDRY	WATTAGE AVERAGE	EST. KHW CONSUMED MONTHLY
CLOTHES DRYER (8 LOADS PER WEEK)	4,856	83
IRON (HAND)	1,100	5
WASHING MACHINE (AUTOMATIC)	512	9
WASHING MACHINE (NON-AUTOMATIC)	286	6
WATER HEATER	4,500	300-500

SOURCE: TEXAS POWER AND LIGHT

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FIGURE 1.5

ELIMINATING UNNECESSARY APPLIANCES

Electric Appliances	Kilowatt Hours Consumed Annually	Substitute
Blender	15	egg beater and strong arm
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Dishwasher	363	wash dishes by hand
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Garbage disposal	30	compost food waste
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Vibrator	2	physical exercise
Clock	17	wind-up clock
Can opener		manual can opener
Lawn mower		hand-powered mower
Hedge clipper		hand-powered clipper
Saw		hand-powered saw
Paint mixer		hand-powered mixer

Source: Center for Science in the Public Interest

FIGURE 2.1

FEDERAL TRADE COMMISSION'S PROPOSED APPLIANCE LABEL

BEFORE BUYING

COMPARE ENERGY COSTS

CHECK ENERGY COST

How much will your yearly cost be with this model? How does it compare with other models? Check the figures and spend less on energy.

Help the nation conserve energy

(1) ESTIMATED YEARLY COST OF THIS MODEL

$8

COMPARE ENERGY COSTS

Brands and models of standard size gas clothes dryers have different yearly energy costs:

(2)

Model with lowest energy cost		Model with highest energy cost
$7	$8	$10
	This Model	

(3) MORE COST INFORMATION

The $8 estimate for this model is based on the 1977 national average gas rate of 20.7¢ per therm (100 CF) and 8 loads of clothes per week.

(3) Check this table to estimate your yearly cost:

	Cost per therm				
	15¢	20¢	25¢	30¢	35¢
Loads of 2	$2	$2	$3	$3	$3
clothes 4	$3	$4	$5	$6	$7
per week 6	$5	$7	$8	$9	$10
8	$7	$9	$10	$13	$14
12	$10	$13	$16	$18	$21

WARNING

Removal of this lable before consumer purchase is a violation of federal law. (42 U.S.C. 6302)

(4) SOURCE OF COST INFORMATION

Estimates are based on U.S. Government standard tests. Your cost will depend on your utility rate and how you use the product.

SOURCE: CONSUMERS UNION OF UNITED STATES, INC.

FIGURE 2.1

FEDERAL TRADE COMMISSION'S PROPOSED APPLIANCE LABEL

THE FTC'S PROPOSED APPLIANCE LABELS WOULD PROVIDE INFORMATION ABOUT ENERGY COSTS IN VARIOUS WAYS, AS SHOWN IN THIS HYPOTHETICAL LABEL.

1. THE ESTIMATED YEARLY COST FIGURE GIVES YOU ONE MORE FACTOR TO USE IN CHOOSING AN APPLIANCE. ALL OTHER THINGS BEING EQUAL, AN APPLIANCE THAT HAS A HIGH PRICE BUT A RELATIVELY LOW OPERATING COST MIGHT BE A BETTER BARGAIN THAN A LOW-PRICED MODEL WITH A HIGH OPERATING COST.

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3. BECAUSE FEW PEOPLE PAY NATIONAL AVERAGE ENERGY PRICES, AND BECAUSE PATTERNS OF USE VARY, THE LABELS WOULD GIVE A RANGE OF ESTIMATED COSTS FOR EACH MODEL.

4. AN IMPORTANT REMINDER: THE ESTIMATES ON THE LABELS MAY NOT REFLECT YOUR ACTUAL COSTS, BUT THEY MAY ALLOW YOU TO PICK OUT THE RELATIVELY EFFICIENT APPLIANCES. KEEP IN MIND, ALSO, THAT THE ENERGY-COST ESTIMATES ON THE LABEL INDICATE NOTHING ABOUT THE PERFORMANCE, CONVENIENCE, SAFETY, OR DURABILITY OF A PARTICULAR APPLIANCE.

SOURCE: CONSUMERS UNION OF UNITED STATES, INC.

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